

REMARKS

In response to an Official Action dated November 28, 2006, Applicant respectfully submits the following remarks. This application contains claims 1-28, all of which were rejected in the Official Action. Reconsideration is respectfully requested in view of the remarks that follow.

Claims 1-23 and 25-28 were rejected under 35 U.S.C. 103(a) over Edgar et al. (U.S. Patent 5,537,530) in view of Liou et al. (U.S. Patent 6,278,446). Applicant respectfully traverses these rejections.

Edgar describes a method for video editing by locating segment boundaries and reordering segment sequences. A computerized process analyzes digitized video source material and identifies boundaries of segments or scene changes (col. 4, lines 13-17). Once the system has determined all relevant scene changes, it attempts to find the most representative image from each scene sequence to represent that sequence (col. 12, lines 1-13). After the segments have been identified in this manner, Edgar's representative frames are displayed, permitting a user to perform video editing by manipulating these representative frames (col. 3, lines 34-46). According to Edgar, the user may consolidate selected representative frames ("stills") in order to put together a "meaningful collection of video from the user's perspective, which was not necessarily sequential as originally created..." (col. 4, lines 51-57).

Liou describes a system for interactive organization and browsing of video. Raw video images are organized into shots, which are represented by representative frames (col. 5, lines 41-50). Shots are clustered into visually-similar groups based on image colors and edge information (col. 3, lines 36-40). The clusters are generated based on the color feature vectors of the shots, wherein each cluster is specified by the mean feature vector of its members (col. 10, lines 38-41). When a new shot is added to a cluster, the mean feature vector of the cluster is updated to include the feature vector of the new shot (col. 10, lines 47-49). Fig. 11, cited by the Examiner, shows a method for grouping shots in this manner, using the mean color feature vector C and the mean edge feature vector M (see particularly steps C, E and I, and col. 11, lines 6-38).

Claim 1 recites a method for organizing a sequence of video frames made up of first and second portions in the following manner:

1) Starting from an initial frame, the first portion of a segment is defined by adding subsequent, similar frames to the segment.

2) One of the frames in the first portion is chosen to be the representative frame for the entire segment.

3) Using this selected representative frame, the computer then goes on (automatically) to add to the segment further frames having a measure of similarity to the representative frame that is within a predefined bound in order to make up the second portion of the segment.

In other words, after selecting the representative frame, the computer automatically measures the similarity between the representative frame and subsequent frames, and uses this similarity in determining which subsequent frames to add to the segment.

In rejecting claim 1 in the present Official Action, the Examiner acknowledged that Edgar does not describe the determination of any measure of similarity between his representative frame and other frames, but asserted that Liou teaches such a measurement. Liou, however, uses an entirely different criterion for adding new shots to a cluster, as explained above: the distance between the new shot and the mean feature vector of the existing cluster. When a new shot is added to a cluster, the mean then changes accordingly (col. 10, lines 47-49). Liou neither teaches nor suggests choosing a certain representative frame and then adding subsequent frames in a video sequence depending on their similarity to this particular representative frame, as recited in claim 1.

Thus, Applicant respectfully submits that claim 1 is patentable over the cited art. In view of the patentability of claim 1, claims 2-11, which depend from claim 1, are believed to be patentable, as well.

Furthermore, notwithstanding the patentability of claim 1, dependent claims 2-11 are believed to be independently patentable. For example, claim 5 recites the use of a bounding subset in adding further frames to the sequence. The Examiner stated that Edgar teaches this limitation in col. 4, lines 57-61, and col. 8, lines 12-16. The passage in col. 4, as noted previously, refers to selection by a user of frames making up a sequence and a representative frame for the sequence. The passage in col. 8 describes an image “fingerprint” that is used to find scene transitions. Neither in these passages, nor in any other passages, does Edgar even hint at the use of a bounding subset in

adding further frames to a segment “while the distance between each of the added frames and the frames in the representative set is within the predefined bound,” as required by claim 5.

Claims 6 and 7 depend from claim 5 and recite further features of the selection and use of the bounding subset. Since Edgar fails to teach or suggest the use of a bounding subset, he clearly cannot be taken to teach the added limitations in these claims. Thus, claims 5-7 recite independently-patentable subject matter. Similar arguments may be made with respect to the other dependent claims, but these arguments are omitted here for the sake of brevity.

Claim 12 recites apparatus for organizing a sequence of video frames, while claim 23 recites a computer software product, both of which operate on principles similar to the method recited in claim 1. These claims were rejected over Edgar in view of Liou on grounds identical to the grounds of rejection cited against claim 1. Therefore, for the reasons stated above, Applicant respectfully submits that claims 12 and 23 are patentable over the cited art, as are claims 13-22, which depend from claim 12.

Independent claim 25 recites a method for organizing a sequence of video frames that begins with generating a first portion of the segment, which is bounded by a bounding subset comprising at least three of the frames. One of the frames in the first portion is selected as a representative frame. A second portion of the segment is then generated by adding further frames in the sequence whose distances from the representative frame are within a predefined bound.

The Examiner rejected claim 25 solely on the grounds that it is “similar in scope” to claim 5, without further explanation. Even if the Examiner’s assertion were correct, Edgar and Liou neither teach nor suggest the features of claim 5, as explained above. Furthermore, claim 25, unlike claim 5, recites that the bounding subset that is used in generating the first portion of a segment in a video sequence comprises at least three frames. The Examiner has not pointed to any teaching or suggestion of a bounding subset of this sort in either Edgar or Liou. (In fact, in regard to claim 24, the Examiner acknowledged that Edgar and Liou do not teach a subset comprising at least three frames.)

Therefore, claim 25 is patentable over the cited art, as are claims 26-28, which depend from claim 25.

Notwithstanding the patentability of independent claim 25, dependent claims 26-28 are believed to be independently patentable over Edgar and Liou. For example, claim 26 recites that the bounding subset is selected so as to maximize a sum of the distances between all of the frames in the subset, while each of the distances is no greater than a predetermined maximum. The Examiner rejected claim 26 on the grounds of being similar in scope to claim 6. In rejecting claim 6, the Examiner cited Edgar's Table 2, which lists Edgar's "fingerprint variables" (col. 8, lines 59-62). These variables are used in deriving a difference between two images (col. 9, lines 50-51). Edgar makes no mention of any sort of subset at all, let alone a bounding subset, nor does he suggest that the distances between frames in such a subset be maximized, as recited in claims 6 and 26.

Thus, claim 26 is independently patentable over the cited art. Similar arguments may be made with respect to claims 27 and 28, but they are omitted here for the sake of brevity.

Claim 24 was rejected under 35 U.S.C. 103(a) over Edgar and Liou, in view of Toklu et al. (U.S. Patent 6,549,643). Applicant respectfully traverses this rejection.

Toklu describes a system and method for selecting key-frames of video data in a video file or stream. Toklu assumes that the data have already been partitioned into video segments, preferably video shots, using a method described in another patent (col. 6, lines 54-60). His system then chooses key-frames to represent the video segments and eliminates the key-frames that are visually similar (col. 6, lines 29-34). As part of this process, a motion activity (MA) curve is generated (col. 9, lines 18-30), and is then binarized (col. 9, lines 31-42) and smoothed (col. 9, lines 47-64).

Claim 24 depends from claim 5, and adds the feature that a bounding subset comprising at least three frames is used in adding frames to form the first portion of a segment of a video sequence. In rejecting claim 24, the Examiner acknowledged that Edgar and Liou do not teach a bounding subset comprising at least three frames, but maintained that Toklu teaches such a subset in col. 9, lines 52-54. The cited passage reads:

"The first step of the smoothing process is to eliminate the holes that are less than or equal to 3 frames long" (col. 9, lines 52-54).

This step refers to smoothing of the binary motion activity (MA) curve mentioned above, by changing the MA values of a group of three or less consecutive frames from 0 to 1. The "hole" does not bound anything, nor does it have anything to do with adding frames to a segment of a video sequence. (It appears that the only possible pertinence of the cited passage to the limitations of claim 24 is that the passage mentions three video frames.)

Therefore, notwithstanding the patentability of claim 5, claim 24 recites independently-patentable subject matter.

Applicant believes the remarks presented above to be fully responsive to all of the grounds of rejection raised by the Examiner. In view of these remarks, all the claims in the present patent application are believed to be in condition for allowance. Prompt notice to this effect is requested.

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